

REMARKS

In the Office Action mailed November 28, 2003, the Examiner indicated that the Action was final. Claims 1-7 stand rejected. Reconsideration of the application is respectfully requested.

Rejections Under 35 U.S.C. § 103

The Examiner rejected claims 1-7 under 35 U.S.C. § 103(a) as being unpatentable over Moinpour et al. (U.S. Pat. No. 5,868,857) in view of Matsukawa et al. (U.S. Pat. No. 5,518,542). Applicants respectfully traverse this rejection.

The burden of establishing a *prima facie* case of obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (PTO Bd. App. 1979). Obviousness cannot be established by combining or modifying the teachings of the prior art to produce the claimed invention absent some teaching or suggestion supporting the combination or modification. *See ACS Hospital Systems, Inc. v. Montefiore Hospital*, 732 F.2d 1572, 1577, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984). Accordingly, to establish a *prima facie* case, the Examiner must not only show that the combination or modification includes *all* of the claimed elements, but also a convincing line of reason as to why one of ordinary skill in the art would have found the claimed invention to have been obvious in light of the teachings of the references. *See Ex parte Clapp*, 227 U.S.P.Q. 972 (B.P.A.I. 1985).

The present application is directed to an apparatus for *inspecting* semiconductor wafers. The illustrated embodiment, for example, provides means for visually inspecting the wafer

without the user having to touch the wafer. Members of a holding structure hold a wafer and rotate the wafer about a first axis that extends through the axial center of the wafer perpendicular to the wafer surface. The holding structure is mounted on a rotational arm so that the holding structure (i.e., with the secured wafer) may rotate about a second axis parallel to the wafer surface. Accordingly, claim 1 recites an apparatus for inspecting wafers comprising, “a holding structure having members arranged to hold and rotate the substrate about a first axis, the holding structure being coupled to a rotatable member, the rotatable member configured to rotate the holding structure about a second axis different from the first axis.”

In contrast, the two references relied on by the Examiner are directed to *cleaning* semiconductor wafers. The cleaning apparatuses disclosed in the cited combination do not address the capability envisaged in claim 1 of inspecting a wafer by securing and rotating the wafer by varying degrees about two axes. The Examiner attempts to render claim 1 obvious by combining the wafer spinning feature of the Moinpour reference to provide rotation about a first axis, with the wafer flipping feature of the Matsukawa reference to provide rotation about a second axis. However, contrary to the Examiner’s assertion, the Moinpour reference does not disclose “a holding structure having *members* arranged to *hold and rotate* the substrate about a first axis,” as recited by claim 1. Accordingly, as discussed further below, neither the Moinpour reference nor the Matsukawa reference either alone or in combination, discloses an inspection apparatus having each of the elements and characteristics recited in the present claims.

As a preliminary matter and referring initially to the Moinpour reference, the Moinpour reference teaches a structure configured to spin the wafer (about only one axis) to facilitate

cleaning of the wafer edges. *See* column 3, lines 23-2, column 4, lines 13-14, Figs. 1-6. The Moinpour reference is *not* directed to a structure for holding and rotating a wafer at various angles and through various axes to facilitate inspection. In fact, the reference does not even address how the wafer is held in place. This is not surprising because the Moinpour reference is directed to cleaning of the wafer edges, and the reference even acknowledges that “components, structures and techniques have not been shown in detail in order to avoid obscuring the present invention [of cleaning wafer edges].” Column 2, lines 58-60. Indeed, the wafer illustrated in the Moinpour figures appears to be floating in mid-air and the Moinpour text never discusses or even hints at how the wafer is supported. Regardless and as further discussed below, it is clear that the Moinpour reference *does not* disclose a structure having members arranged to hold and rotate the substrate, “as recited in the present claims.”

Initially, in the rejection of claims 1-7, the Examiner stated:

Regarding claim 1, Moinpour et al. disclose (fig 5B) a holding structure (510) having members arranged to hold and rotate (column 4 line 28-37) the substrate (502) about a first axis, the holding structure (510) being coupled to a rotatable member (512).

Applicants respectfully disagree with Examiner’s assertion that the Moinpour reference discloses that the edge rollers (510) are a holding structure and respectfully submit that any assertion that the edge rollers are configured to hold a wafer is a mischaracterization of Moinpour. The Moinpour reference simply discloses that the edge rollers (510) and motors (512) rotate the wafer (502) in a counter-clockwise direction so that an edge cleaning apparatus (600) can scrub the entire circumference of the wafer. Col. 4, lines 30-32. The Moinpour reference

never mentions or implies that the edge rollers (510) *hold* the wafer (502) to the contrary, the Moinpour reference only discloses that the edge rollers (510) *rotate* the semiconductor wafer (502). *Id.* Indeed, as previously mentioned, the cited reference never addresses how the wafer is supported or held in place. Instead, the focus of the reference is the modification of a scrubbing tool to clean the edges of semiconductor wafers. Col. 2, lines 65-67. The Examiner's assertion that the edge rollers (510) are configured to hold the wafer cannot be supported by anything disclosed in the Moinpour reference.

With further regard to this point, the Examiner found Applicants' prior remarks unpersuasive and stated:

The applicant argues that the edge rollers (510) of the '857 patent does not hold the wafer at all, the examiner is disagree. The edge rollers play an important roll of supporting and rotating wafer counter clock wise during the process of cleaning, if there are no edge rollers, then the wafer does not has any support at all to hold it off.

To the contrary, as previously discussed, there is no support in the cited reference for the Examiner's assertion that the "edge rollers play an important role of supporting [the] wafer." If the edge rollers 510 played such a crucial role in supporting or holding the wafer, as the Examiner argues, then it would seem that the reference would at least indicate such. Instead, the reference is completely silent with regard to the structure configured to hold the wafer. The edge rollers (510) are only mentioned in two sentences (three lines) of the entire reference, entirely reproduced here: "[e]dge rollers 510 are provided to *rotate* wafer 502 in a counter-clockwise direction as indicated. Motors 512 are coupled to edge rollers 510 to *provide rotational movement to the wafer.*" Col. 4, lines 30-32 (emphasis added). There is nothing to indicate that

the edge rollers (510) are configured to *hold* the wafer. Accordingly, it is clear that the Examiner's assertion is wholly unsupported by the reference.

Still further, the Examiner misinterprets Fig. 5B of the reference in stating that "if there are no edge rollers, then the wafer does not [have] any support at all." It is clear that both the text and *figures* of the Moinpour reference never describe how the wafer is held or supported. For example, in Figs. 2A, 2B, 3A, 3B, 4A, and 4B, the wafer is illustrated as floating in mid-air as if not requiring any support. Clearly, the Moinpour system is not illustrated in its entirety, to avoid obscuring the Moinpour invention. Likewise, Figs. 5A and 6, and Fig. 5B relied on by the Examiner, illustrate only elements that play a direct role in cleaning the wafer and do not illustrate elements that prevent the wafer from falling or sliding from the assembly. The Examiner's suggestion that unless the edge rollers (510) support the wafer, the wafer has no support at all, completely ignores Moinpour's explicit statements regarding the limited structures illustrated and described throughout the reference.

In sum, it is clear from the Moinpour reference that the edge rollers (510) do not necessarily support or hold the wafer (502) as argued by the Examiner. The Examiner has incorrectly characterized the Moinpour reference as disclosing a "*holding structure having members arranged to hold and rotate the substrate about a first axis,*" as recited in claim 1. Because the Matsukawa reference does not cure this deficiency of the Moinpour reference, the cited combination fails to disclose all of the elements recited in claim 1, and thus neither reference alone or in combination, can possibly render the recited subject matter obvious.

The cited combination also fails to disclose a “rotatable member configured to rotate the holding structure about a second axis different from the first axis,” as recited in claim 1. The Examiner correctly admitted this deficiency of the Moinpour reference but incorrectly asserted that the Matsukawa reference cures this deficiency. Specifically, the Examiner stated:

Moinpour et al. is silent on the rotatable member configured to rotate the holding structure about a second axis different from the first axis.

On the other hand, Matsukawa et al. teach on the rotatable member configured to rotate the holding structure (111a, 111b) about a second axis (flipping) different from the first axis for the purpose of providing the ability for testing system to test the wafer from different angle.

It would have been obvious to one having an ordinary skill in the art at the time of the invention was made to modify the robots arm of Moinpour et al. and providing the flipping feature as taught by Matsukawa et al. for the purpose of providing the ability for testing system to test the wafer from different angle.

Contrary to the Examiner’s assertion, the Matsukawa reference is *not* concerned with wafer testing or inspection, but rather directed toward a wafer cleaning system. Accordingly, the Examiner’s characterization of the Moinpour reference as providing a mechanism for testing a wafer from different angles is without merit. Regardless, Applicants respectfully assert that the Matsukawa reference does not disclose all of the elements recited in the present claims, nor does it cure the deficiencies of the Moinpour reference.

The Matsukawa reference discloses a cleaning system having holding structure (111a, 111b) coupled to a rotating shaft (102). Column 6, lines 18-29. While the holding structure

(111a, 111b) is coupled to a rotating shaft (102) that facilitates rotation of the wafer about the rotating shaft, the Matsukawa reference does not disclose any mechanism for rotating the wafer held in the holding structure (111a, 111b) about a second axis different from the first. To accomplish rotation of the wafer about a second axis, such as one perpendicular to the wafer, the holding structure (111a, 111b) must first deposit the wafer onto the wafer support base 130 to allow the spin chuck 120 to rotate the wafer *after* the holding structure (111a, 111b) has released the wafer. Column 6, lines 35-50, column 7, lines 20-54. Thus, since the Matsukawa reference does not disclose a holding structure arranged to hold and rotate the wafer about a first axis, and also configured to rotate the wafer about a second axis, it is clear that the Matsukawa reference alone does not disclose all of the elements of the recited claims. Further, the Matsukawa reference fails to cure the deficiencies of the Moinpour reference since the Matsukawa reference does not disclose a holding structure having members arranged to hold and rotate a wafer).

While it is clear that the cited combination fails to disclose all of the elements necessary to support a *prima facie* case of obviousness, there is also no suggestion to combine these references in the manner recited in the present claims. Specifically, Applicants would like to address the Examiner's assertions regarding the suggestion to modify the cleaning system disclosed in the Moinpour reference. The Examiner stated that the Moinpour reference could be modified by providing the flipping feature as taught by Matsukawa for "the purpose of providing the ability for testing system to test the wafer from different angle." However, as previously discussed, the Moinpour reference is directed to *cleaning* a wafer, not *testing* or *inspecting* a wafer. Accordingly, the technique disclosed by the Moinpour reference provides an apparatus for cleaning the edges, top surface and bottom surface of a wafer. Because the Moinpour

reference already teaches a technique for cleaning the entire surface of the substrate there would be no motivation to further modify the technique with aspects of the Matsukawa reference. It is well settled that when prior art references require a selected combination to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gained from the invention itself, i.e., something in the prior art as a whole must suggest the desirability, and thus the obviousness, of making the combination. *Uniroyal Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 5 U.S.P.Q.2d 1434 (Fed. Cir. 1988); *see also* M.P.E.P § 2143.01 (noting that the mere fact that references *can* be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination).

Applicants further assert that incorporating the holding structure (111a, 111b) of Matsukawa into the cleaning apparatus of Moinpour would actually *hinder* cleaning of the wafer edges, as taught by the Moinpour reference. For example, encasing the wafer edges with the Matsukawa holding structure (111a, 111b) would impede access to the edge of the wafer by the water/chemical supply nozzle 535, the belt 606, and so forth. It would also interfere with the rotating brushes 504 and 506 that clean the wafer surface. In sum, incorporation of the Matsukawa holding structure (111a, 111b) would frustrate the cleaning purpose in Moinpour and thus is not desirable. If a proposed modification renders the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. M.P.E.P § 2143.01 (citing *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)). Accordingly claim 1 is believed allowable over the cited combination for this reason as well.

Finally, while it is clear there is no suggestion or motivation to combine the references, there is also no reasonable expectation of success in modifying the Moinpour cleaning apparatus by incorporating the Matsukawa wafer flip and holding structure (111a, 111b) to accomplish the capability of the present claims. *See* M.P.E.P § 2143.02 (noting that there must be a reasonable expectation of success to modify or combine the prior art to reject claims as *prima facie* obvious). First, the Examiner has not explained the feasibility of flipping (rotating 180 degrees) the configuration of cleaning elements in the Moinpour reference. The cleaning elements, such as the rotating brushes 504 and 506, belts 606, chemical/water supply 535, extended motors 512, and so forth, are not secured for a 180 degree flip. This is in contrast with the present illustrated embodiment which shows members that rotate the wafer about a first axis that are secured compactly within a holding structure. Second, it is not clear as to how supply of utilities, such as chemicals, water, electricity, and the like, to these cleaning elements would be accommodated in the flipping of the cleaning configuration. Third, the cleaning elements in Moinpour would obstruct inspection of a wafer. In total, the Examiner has not described how the cited combination would accomplish the capability of the present claims. Accordingly claim 1 is believed allowable over the cited combination for these reasons as well.

The Examiner's assertion that one skilled in the art would be motivated to modify the *cleaning* system of Moinpour to provide the ability to *test* a wafer from different angles is without merit. Not only do the cited references fail to disclose each of the elements recited in the present claims, but the Examiner has failed to meet his burden in showing why one skilled in the art would be motivated to modify or combine these disparate teachings in the manner recited in claim 1. *See* M.P.E.P § 2142 (directing that the initial burden is on the Examiner to provide

some suggestion of the desirability of combining the cited references to render the claimed invention obvious).

As for the dependent claims, the Examiner stated:

Regarding claim 2, Moinpour et al. discloses (fig 5B) the members (510) comprises a plurality of wedge assemblies configured to rotate the substrate (502) about the first axis.

Regarding claim 3, Moinpour et al. discloses (fig 5B) the first axis is disposed generally perpendicular to a flat surface of the substrate (502) and extends generally through an axial center of the substrate.

Regarding claims 4, Matsukawa et al. discloses (fig 12) the holding structure comprises two L shaped gripping arms (111a, 111b) arranged to form a single U shape and configured to hold the substrate substantially parallel to the gripping arms.

Regarding claims 5, 6, Matsukawa et al. discloses the U shaped structure is configured to open and close about the perimeter of the substrate (W).

Regarding claim 7, Moinpour et al. discloses (fig 5B) the holding structure (510) comprises three wedge assemblies (as seen in the figure), at least one wedge assembly coupled to a motor (512) and configured to rotate the substrate (502) about the first axis disposed generally perpendicular to a flat surface of the substrate (502) and extending generally through an axial center of the substrate.

Initially, applicants note that claims 2-7 ultimately depend from independent claim 1, and thus these dependent claims are patentable for the reasons provided with respect to independent claim 1. Dependent claims 2-7 are also patentable for additional reasons by virtue of the subject matter recited in each dependent claim.

In rejecting claim 2, the Examiner correlated the edge rollers (510) with the *members* of the holding structure as recited in claims 1 and 2. This is inconsistent with the Examiner's rejection of claim 1 in which the same edge rollers (510) were correlated with the *holding structure* itself. The claims recite "a *holding structure* having *members* arranged to hold and rotate the substrate about a first axis." Thus, the present claims recite two distinct elements: a "holding structure" and "members." To establish *prima facie* obviousness, all the claim limitations, including these two distinct elements must be taught or suggested by the cited art. See M.P.E.P § 2142 (noting that all words in a claim must be considered in judging the patentability of that claim against the cited art). Moreover, Applicants note that as previously discussed, the Moinpour reference does not even disclose a "holding structure," much less a holding structure having members comprising a plurality of wedge assemblies, as further recited in claim 2. Thus, because the Moinpour reference clearly does not disclose "a *holding structure* having *members* arranged to hold and rotate the substrate about a first axis," the reference cannot possibly disclose holding structure *members* comprising "a plurality of wedge assemblies configured to rotate the substrate about the first axis," as recited in claim 2. Applicants respectfully request that the Examiner clarify any perceived correlation between the edge rollers (510) and elements of the present claims and particularly state which recited element is believed to have been disclosed by edge rollers (510) of the Moinpour reference.

The Examiner rejected claim 5 on the basis of the Matsukawa reference, stating that the reference discloses the U shaped structure configured to open and close about the perimeter of the substrate as recited in claim 5. However, the Examiner made no statement regarding the "tensioning springs" recited in claim 6, which is dependent on claim 5. However, Applicants

respectfully submit that the Matsukawa reference fails to disclose the “tensioning springs” recited in claim 6. If the Examiner chooses to maintain this rejection, Applicants request that the Examiner specifically identify the location of such features in the Matsukawa reference.

Because the cited references do not disclose all of the elements, much less provide any suggestion to combine or modify the references in the manner recited in claim 1, nor any reasonable expectation of success in the combination, they do not support a *prima facie* case for obviousness. Furthermore, claims 2-7 are believed to be allowable for their subject matter separately recited, as well as for the reasons provided above with respect to independent claim 1. Accordingly, Applicants respectfully request withdrawal of the Examiner’s rejection and allowance of claims 1-7.

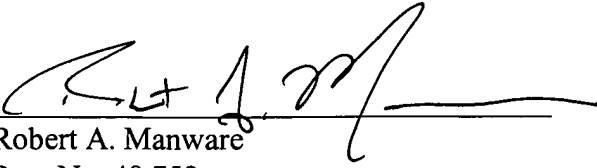
In closing, the Examiner’s citation of additional U.S. references 6,606,154 and 5,052,884 is acknowledged. Applicants have not addressed these additional references because the Examiner did not speak to the details of their subject matter. Applicants, however, believe these additional references do not provide a *prima facie* case of obviousness and will respond in detail if the Examiner relies on these references and addressed them with specificity.

Conclusion

In view of the remarks set forth above, Applicants respectfully request allowance of claims 1-7. If the Examiner believes that a telephonic interview will help speed this application toward issuance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

Date: January 28, 2004

A handwritten signature in black ink, appearing to read 'Robert A. Manware', is written over a horizontal line.

Robert A. Manware

Reg. No. 48,758

FLETCHER YODER

P.O. Box 692289

Houston, TX 77269-2289

(281) 970-4545